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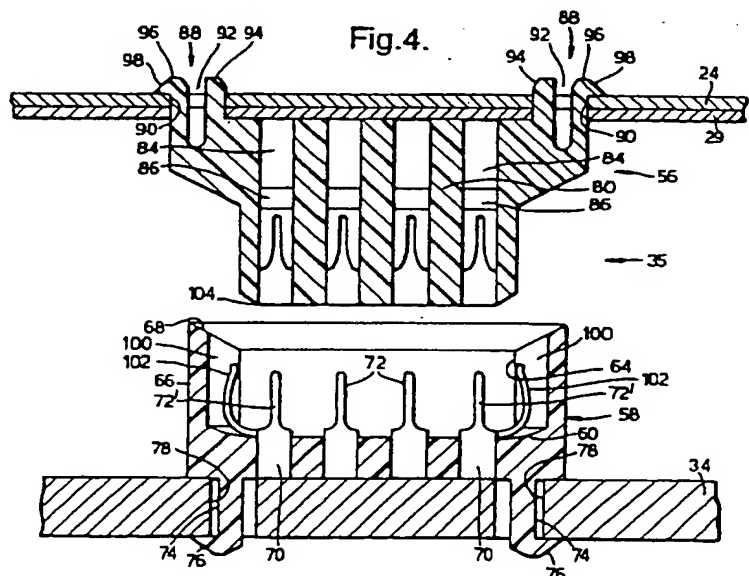
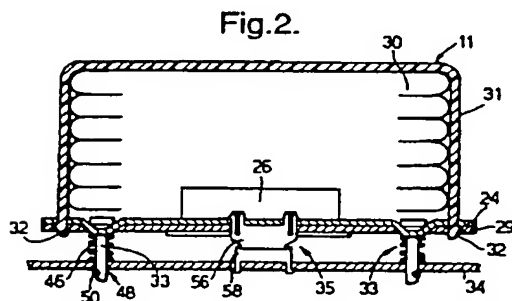
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(54) Abstract Title
Air bag assembly

(57) An air bag assembly for a motor vehicle comprising an air bag module (11) including an air bag (30) and an inflator (26) mounted on a base plate (24); a base (34) mountable in the motor vehicle; fastening means (33,50) for securing the air bag module to the base; and an electrical connector assembly (35) including a first connector (56) secured to the base plate and a second connector (58) secured to the base, the first and second connectors mating on securing the air bag module to the base by the fastening means; wherein each connector has electrical terminals (86,72) which electrically connect on mating of the connectors; and wherein one of the connectors has an electrical shorting clip (102) which connects with at least one of the terminals (72') when the connectors are not mated, and which becomes disconnected from said at least one terminal on full mating of the connectors. Allows hands-free connection of the connectors and provides a indication of full mating.



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Fig.1.

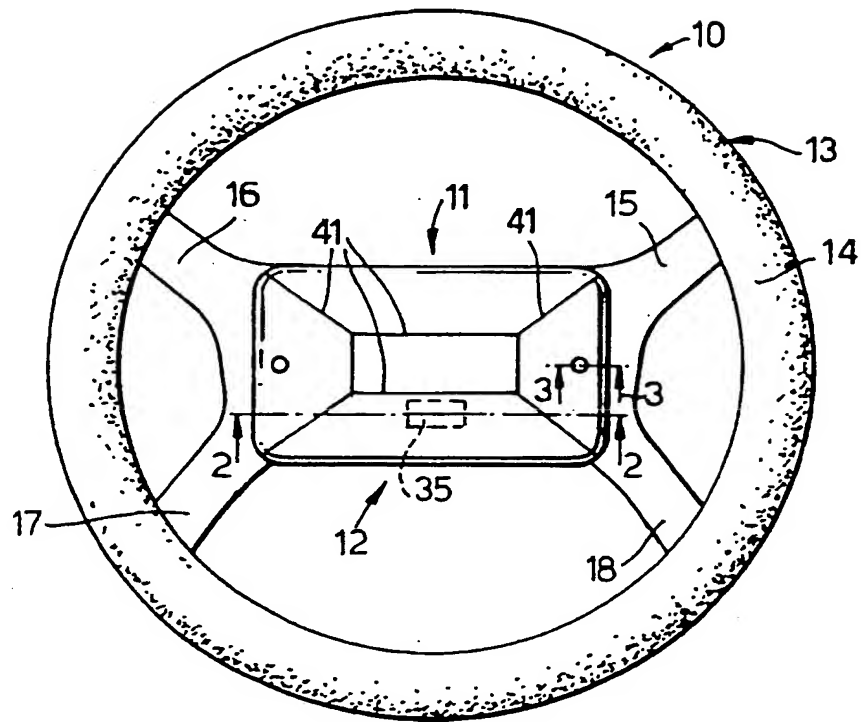


Fig.2.

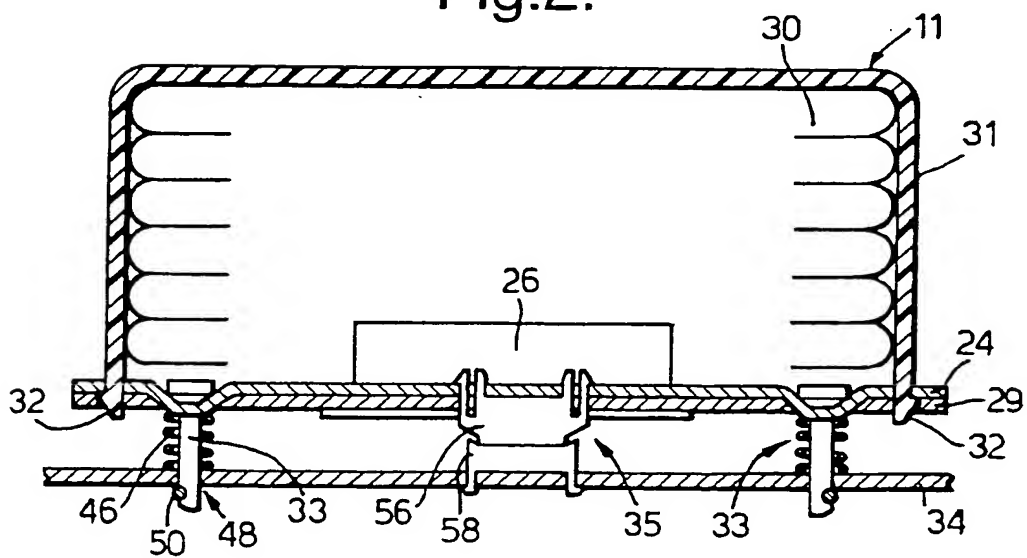


Fig.3.

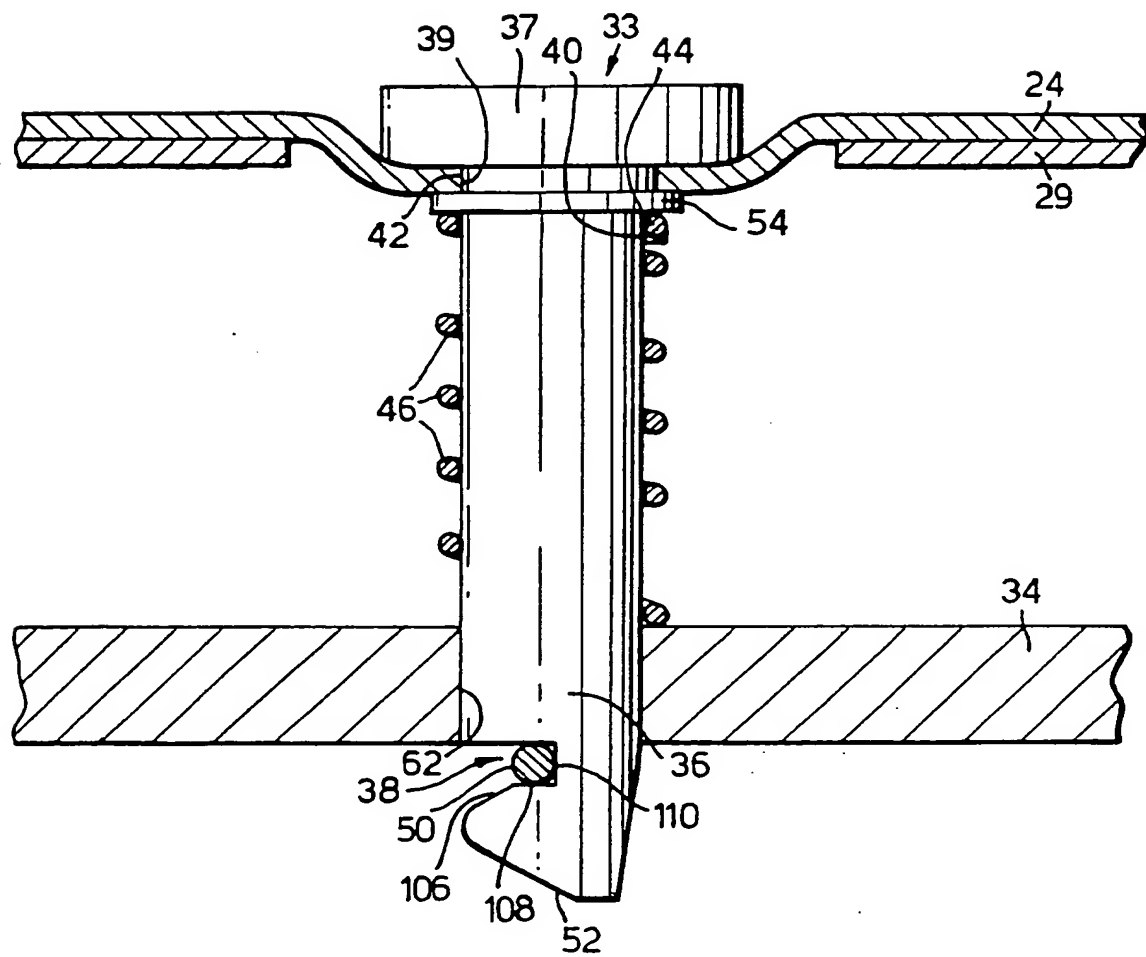
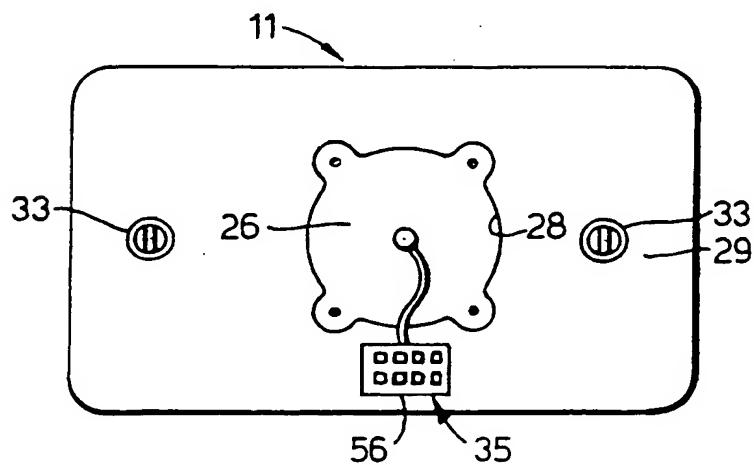
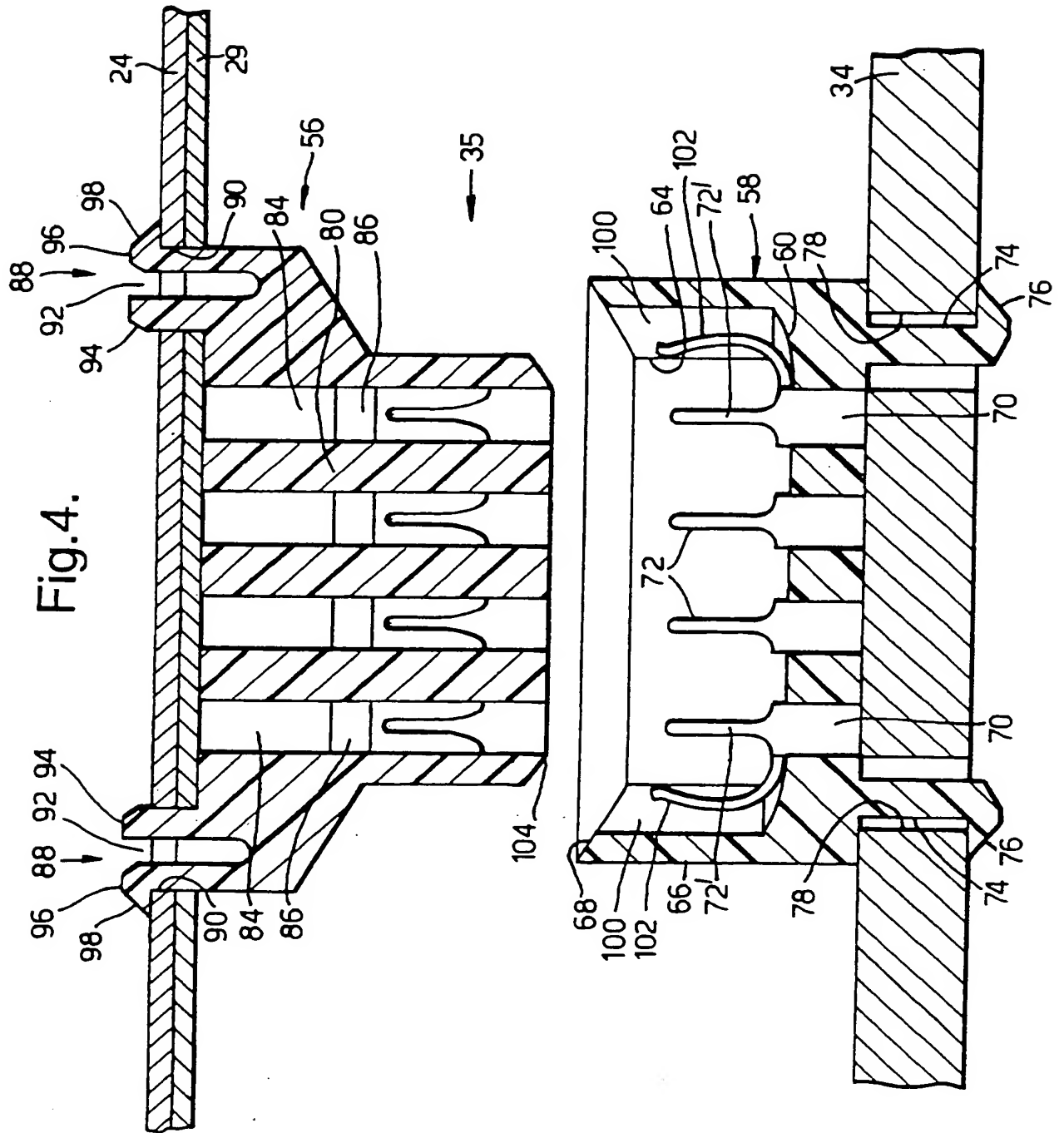


Fig.6.





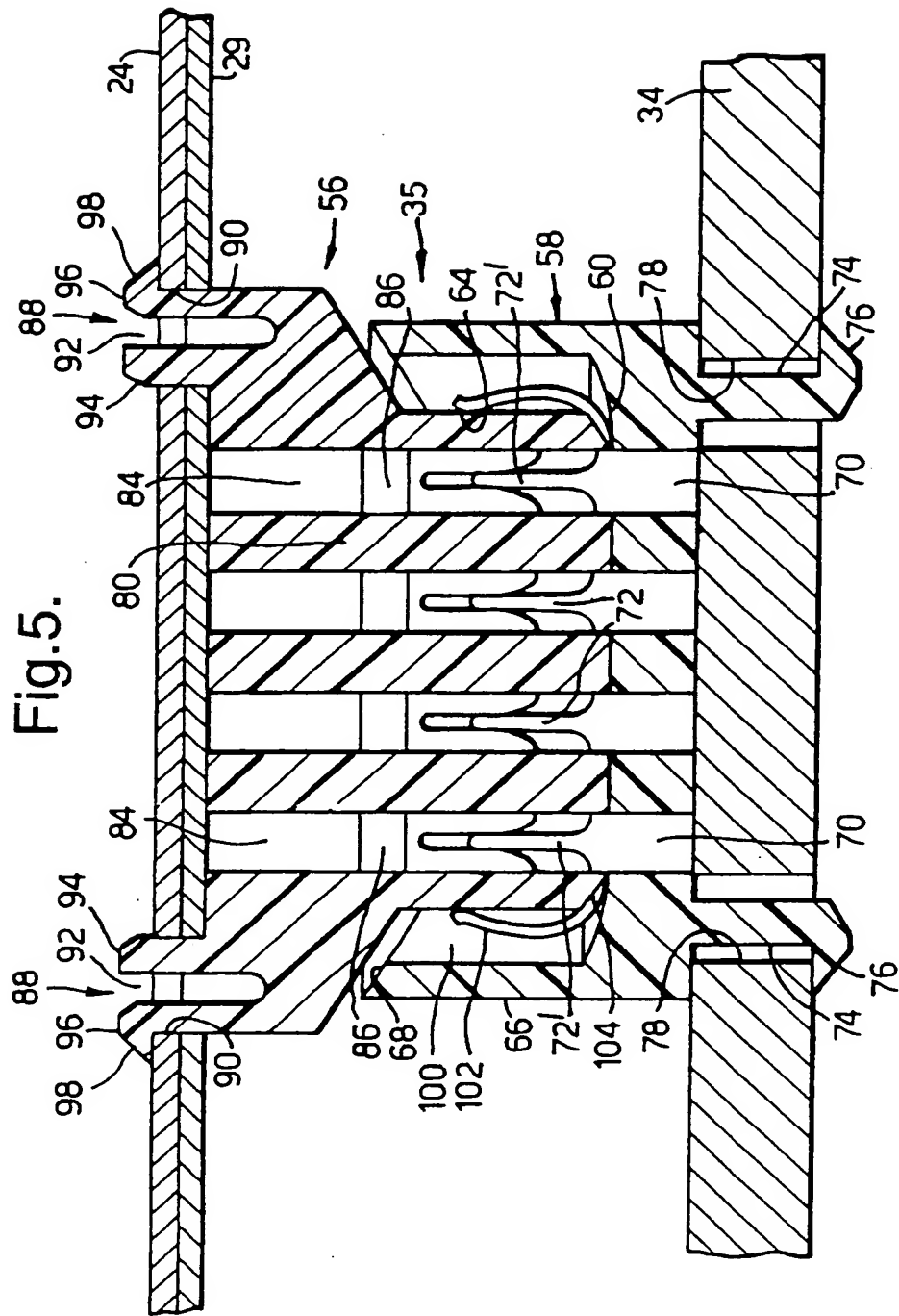
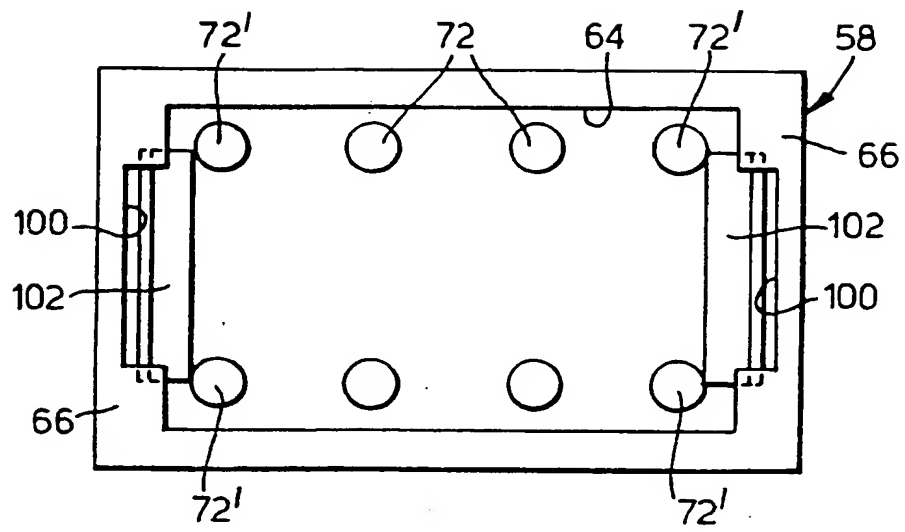


Fig.7.



AIR BAG ASSEMBLY

Technical Field

The present invention relates to an air bag assembly for a motor vehicle.

5 Background of the Invention

Most passenger vehicles have a driver's side air bag assembly comprising an air bag module mounted on the steering wheel. The air bag module generally includes an air bag, an inflator, a base plate for mounting the air bag to the inflator, and a cover for enclosing the air bag. The inflator
10 is electrically connected to control electronics through an electrical connector assembly having mating connectors. One connector of the connector assembly is attached to a pig tail that is connected to the inflator and the other connector of the connector assembly is attached to a pig tail extending from the steering column. The air bag module is secured to the base of the steering
15 wheel by a plurality of fasteners. During installation of the air bag module to the steering wheel, the assembler first mates the two connectors by hand, then fits by hand a connector positive assurance (CPA) device to ensure electrical connection between the connectors, and finally secures the air bag module to the steering wheel base using the fasteners. The installation of the driver's
20 side air bag module on the steering wheel therefore involves a number of complex and time consuming steps. Similar complexities are involved with the installation of other air bag modules in a motor vehicle.

Summary of the Invention

25 It is an object of the present invention to provide an air bag assembly which is easier and quicker to install.

An air bag assembly in accordance with the present invention for a motor vehicle comprises an air bag module including an air bag and an

inflator mounted on a base plate; a base mountable in the motor vehicle;
fastening means for securing the air bag module to the base; and an electrical
connector assembly including a first connector secured to the base plate and a
second connector secured to the base, the first and second connectors mating
5 on securing the air bag module to the base by the fastening means; wherein
each connector has electrical terminals which electrically connect on mating of
the connectors; and wherein one of the connectors has an electrical shorting
clip which connects with at least one of the terminals when the connectors are
not mated, and which becomes disconnected from said at least one terminal on
10 full mating of the connectors.

The present invention allows an assembler to electrically
connect the connector assembly simply by securing the air bag module on the
base. The present invention provides for hand-free mating of the connectors
of the connector assembly, and a positive indication of full and correct mating
15 of the connectors. The present invention may also provide an indication of
full and correct installation of the air bag module on the base. The present
invention lends itself to automated installation of the air bag module in the
motor vehicle.

The present invention has particular application in the
20 installation of an air bag module on the base of a steering wheel of a motor
vehicle. The present invention may also be used for installing other air bag
modules in a motor vehicle, in which case, for example, the base could be an
integral part of the dashboard (for a passenger air bag) or an integral part of
the door (for door mounted air bags).

25

Brief Description of the Drawings

The present invention will now be described, by way of
example, with reference to the accompanying drawings, in which:-

Figure 1 is a top plan view of an air bag assembly in
30 accordance with the present invention;

Figure 2 is a cross-sectional view on the line 2-2 of Figure 1;

Figure 3 is an enlarged cross-sectional view taken on the line 3-3 of Figure 1;

Figure 4 is an enlarged cross-sectional view of the electrical connector assembly of the air bag assembly of Figure 1 prior to mating of the connectors;

Figure 5 is an enlarged cross-sectional view of the electrical connector assembly of the air bag assembly of Figure 1 after full mating of the connectors;

Figure 6 is a bottom plan view of the air bag module of Figure 2; and

Figure 7 is a top view of the female connector of the electrical connector assembly of Figure 4.

Description of the Preferred Embodiment

Referring to Figure 1, the air bag assembly 10 includes an air bag module 11 suitably mounted on a central hub portion 12 of a steering wheel 13 of a motor vehicle. The steering wheel 13 also includes a substantially circular rim portion 14 connected to the hub portion 12 by spoke portion 15-18 extending therebetween. Referring also to Figures 2 and 6, the air bag module 11 is mounted on a base 34 defined by the hub portion 12 of the steering wheel 13, and includes a substantially rectangular base plate 24, made of rigid material. The air bag module 11 also includes an inflator 26 for generating gas. The inflator 26 is mounted within a central opening 28 of an annular backing plate 29. The backing plate 29 is secured to the bottom surface of the base plate 24. The inflator 26 may be of any conventional construction. The air bag module 11 further includes an air bag 30 made of a fabric material and connected to the base plate 24. Upon sensing of a predetermined vehicle condition, the air bag 30 is inflated by the gas from the inflator 26 in a well known manner.

In addition, the air bag module 11 includes an air bag cover 31 attached to the base plate 24 in any suitable manner, such as by fasteners 32. The cover 31 is preferably integrally moulded of a single layer of plastics material and thus is relatively easy to manufacture. However, it will be appreciated that the cover 31 could also be comprised of more than one layer and could include an outer decorative cover layer, such as a urethane foam material. The cover 31 overlies the air bag 30 and inflator 26 and maintains the air bag 30 in a folded condition prior to air bag deployment. As shown in Figure 1, an exemplary tear pattern defined by edges 41 is shown. The edges define thinned sections of the air bag cover 31 which will tear during deployment of the air bag 30, as is well known in the art. It will be appreciated that the tear pattern shown in Figure 1 is by way of example only and that other tear patterns may be employed with the present invention.

A pair of studs 33 are mounted to the base plate 24 and extend downwardly to secure the air bag module 11 to the base 34 of the steering wheel 13. The electrical connection from the steering column (not shown) to the inflator 26 is provided through an electrical connector assembly 35.

As best shown in Figure 3, the studs 33 include a cylindrical shank 36 having a head 37 disposed at one end and a substantially V-shaped notch 38 opening radially outward at the other end. Each stud 33 extends through a respective keyed opening 39 in the base plate 24, and through a respective opening 62 in the base 34 of the steering wheel 13. The upper portion 40 of the shank 36 is expanded radially and has a complimentary flat surface 42 to mate with the keyed opening 39 of the base plate 24 to properly position the stud 33 for engagement with the base 34 of the steering wheel 13. The expanded portion 40 of the shank 36 further has an annular groove 44 for retaining one end of a spring 46 coaxially about the shank 36. As shown at 48 in Figure 2, the other end of the spring 46 engages the base 34 of the steering wheel 13 to urge the air bag module 11 away from the base 34 to support the air bag module on the steering wheel 13. The use of the spring 46

is optional. When the air bag module 11 is fully secured to the base 34, a tab or spring wire 50 mounted below the base 34 engages in the notch 38 of the stud 33. The tip 52 of the shank 36 adjacent the notch 38 is chamfered to displace the spring wire 50 sufficiently outward to provide for the spring wire 50 making a snap-fit engagement with the notch. The notch 38 preferably has a chamfered opening edge 106 adjacent the chamfered tip 52 and a substantially rectangular closed end 108. The chamfered edge 106 assists in entry of the spring wire 50 into the notch 38. The rectangular end 108 ensures in retention of the spring wire 50 in the notch 38 during deployment of the air bag 30. The walls of the rectangular end 108 may be shaped to substantially retain the spring wire 50 against the end wall 110 to reduce the risk of rattling of the spring wire. The stud 33 is secured to the base plate 24 by a collar 54 that has a diameter which is greater than the diameter of the keyed opening 39 in the base plate 24.

Referring to Figures 4 and 5, the electrical connector assembly 35 comprises a male connector 56 and a female connector 58 for receiving the male connector. The female connector 58 has a generally rectangular body portion 60. The body portion 60 has a cavity 64 opening longitudinally for receiving the male connector 56. The cavity 64 is defined by outer walls 66 having end surfaces 68 which are preferably chamfered inwardly to assist with locating and guiding of the male connector 56 into the cavity 64. A plurality of through bores 70 extend longitudinally in the female connector 58 for receiving and securing male electrical terminals 72 therein. A pair of resiliently flexible legs 74 extend downwardly from the female connector 58 for engaging the base 34 of the steering wheel 13. The ends of each of the legs 74 have a rounded detent 76 that extend outwardly. The legs 74 are resiliently flexible to pass through apertures 78 disposed in the base 34 and snap lock the female connector 58 to the base 34. The length of the legs 74 is substantially equal to the width of the base 34 to insure the bottom surface of the female connector 58 is in fixed engagement with the top surface of the

base 34 when the legs 74 are snap fit thereto. The width of the apertures 78 is preferably greater than the width of the legs 74 to allow limited lateral movement of the female connector 58 relative to the base 34.

The male connector 56 includes a plurality of channels 84 for
5 receiving and securing therein electrical terminals 86 for mating with the female connector 58. The electrical terminals 86 are female-type for receiving the male electrical terminals 72 of the female connector 58. The male connector 56 engages the base plate 24 and backing plate 29 of the air bag module 11 by a pair of opposing legs 88 that extend upwardly through
10 openings 90 in the plates. Each leg 88 includes a longitudinal slot 92 to form a guide member 94 and a retaining member 96. The guide member 94 engages the inner edge of the openings 90 to guide the legs 88 during insertion in the openings 90. The retaining member 96 has a rounded detent 98 extending outwardly for engagement with the top surface of the base plate
15 24. The retaining member 96 of each leg 88 is resiliently flexible to snap fit to the plates 24,29 to retain the male connector 56 on the air bag module 11. The length of the legs 88 is substantially equal to the width of the plates 24,29 to insure the top surface of the male connector 56 is in fixed engagement with the bottom surface of the backing plate 34 when the legs 88 are snap fit to the
20 plates 24,29.

The electrical connector assembly 35 is preferably positioned substantially midway between the studs 33. Adjacent the two outermost male electrical terminals 72' on one side (and preferably both sides as shown in Figures 4, 5 and 7), a longitudinally extending slot 100 is formed in the inner
25 surface of the outer wall 66 of the female connector 58. The slot 100 opens into the cavity 64. An electrical shorting clip 102 is positioned in the slot 100. The shorting clip 102 extends longitudinally between the outermost terminals 72' and is preferably substantially L-shaped in cross-section. When the male and female connectors 56,58 are disconnected (as shown in Figure
30 4), the shorting clip 102 extends into the cavity 64 and makes an electrical

(shorting) connection between the adjacent two outermost male electrical terminals 72'. When the male connector 56 is inserted in the cavity 64 of the female connector 58, the end face 104 of the male connector 56 engages the shorting clip 102. When the male connector 56 reaches a position of full mating with the female connector 58, the end face 104 of the male connector disconnects the shorting clip 102 from the male terminals 72'. By suitable monitoring of the two male terminals 72' which may be shorted by the shorting clip 102, a signal can be provided when the shorting clip is disconnected. This signal therefore provides a indication of full and correct mating between the male connector 56 and the female connector 58.

By suitable selection of the position, dimension and shape of the notch 38 in each stud 33, the dimension of the chamfered tip 52 of each stud, and the shape and dimension of the or each shorting clip 102, the disconnection of the or each shorting clip is preferably only effected when each spring wire 50 enters its respective notch. That is, if one of the spring wires 50 remains outside its respective notch 38, one or more of the shorting clips 102 maintains the shorting electrical connection between the respective male electrical terminals 72'. With this arrangement, the signal indicating full and correct mating between the male and female connectors 56,58 is only provided when the air bag module 11 is fully secured to the base 34 of the steering wheel 13. The signal will, therefore, also provide an indication of full and correct installation of the air bag module 11 on the steering wheel 13.

The studs 33 provide a number of functions to enable hands free mating of the male and female connectors 56,58 of the electrical connector assembly 35 when securing the air bag module 11 to the base 34 of the steering wheel 13. The snap fit of the spring wires 50 in the notches 38 of the studs 33 provide connector positive assurance (CPA) when the air bag module 11 is mounted on the base 34 and thus eliminate the need to provide a separate discrete CPA device. The length of the shank 36 of each stud 33 is preferably selected such that the shanks enter the openings 62 in the base 34

before the male connector 56 enters the female connector 58 to assist with aligning the male and female connectors 56,58 without the need to handle the electrical connector assembly 35.

The male and female connectors 56,58 may include a plurality
5 of electrical terminals 86,72 to provide electrical power to other electrical devices mounted on the air bag module 11.

In the preferred embodiment described above, the male connector 56 is mounted on the air bag module 11 and the female connector 58 is mounted on the steering wheel 13. It will be appreciated that this
10 arrangement may be reversed without departing from the scope of the present invention. Similarly, the positions of the male and female electrical terminals 86,72 may also be reversed. Still further, the or each shorting clip 102 may be located in the connector 56 associated with the air bag module 11 and make a shorting connection between two terminals in that connector, rather than
15 being located in the connector 58 secured to the base 34. In a further alternative arrangement, the shorting clip 102 may simply make a shorting connection with one terminal 72', the electrical connection between the shorting clip and that terminal being monitored to provide the signal indicating full mating between the connectors 56,58.

Other means for securing the male connector 56 to the plates
20 24,29 and the female connector 58 to the base 34 may be used besides snap-fitting legs 88,74. As described above, the female connector 58 has the capability of limited lateral movement relative to the base 34, which will allow for manufacturing tolerances during alignment and mating of the male
25 and female connectors 56,58. It will be appreciated that the width of the openings 90 in the plates 24,29 may (alternatively or additionally) be similarly enlarged relative to the width of the legs 88 to allow limited lateral movement of the male connector 56 relative to the plates 24,29.

The arrangement of the studs 33 and spring wires 50 may be
30 reversed, with the studs being secured to the base 34 and the spring wires

being mounted on the base plate 24. Other forms of fastening means (for example, screw fastenings) for securing the air bag module 11 to the base 34 may be used besides the studs 33 and spring wires 50 described above.

In a further modification to the present invention, two (or
5 more) connector assemblies 35 may be used, each connector assembly including at least one shorting clip 102. In this case, the connector assemblies 35 would preferably be located between the pair of studs 33. Alternatively, the or each connector assembly 35 may be located radially outwards of the studs 33.

Claims

1. An air bag assembly for a motor vehicle comprising an air bag module including an air bag and an inflator mounted on a base plate; a base mountable in the motor vehicle; a plurality of fastening means for securing the air bag module to the base; and an electrical connector assembly including a first connector secured to the base plate and a second connector secured to the base, the first and second connectors mating on securing the air bag module to the base by the fastening means; wherein each connector has electrical terminals which electrically connect on mating of the connectors; and wherein one of the connectors has an electrical shorting clip which connects with at least one of the terminals when the connectors are not mated, and which becomes disconnected from said at least one terminal on full mating of the connectors.

2. An air bag assembly as claimed in Claim 1, wherein each fastening means comprises a stud which is secured to the base plate or to the base, the stud having a shank which extends through an opening in the other of the base plate or the base; and a spring wire which is mounted on the said other base plate or base and which makes a snap fit in a notch formed in the shank on extension of the shank through the opening.

3. An air bag assembly as claimed in Claim 2, wherein the notch has a predetermined position on its respective shank such that the shorting clip only becomes disconnected from said at least one terminal when the respective spring wire makes a snap fit in the notch.

4. An air bag assembly as claimed in Claim 2 or Claim 3, wherein each stud is secured to the base plate and each spring wire is mounted on the base.

5. An air bag assembly as claimed in any one of Claims 2 to 4, wherein the notch in each stud has a chamfered opening edge.

6. An air bag assembly as claimed in any one of Claims 1 to 5, wherein the shorting clip is positioned in the second connector.

7. An air bag assembly as claimed in any one of Claims 1 to 6, wherein the shorting clip makes a shorting electrical connection between two terminals when the first and second connectors are not mated and which becomes disconnected from one or both terminals on full mating of the first and second connectors.

8. An air bag module as claimed in any one of Claims 1 to 7, wherein the terminals in the first connector are female terminals and the terminals in the second connector are male terminals.

9. An air bag module as claimed in any one of Claims 1 to 8, wherein the first connector is a male connector and the second connector is a female connector.

10. An air bag module as claimed in Claim 9, wherein the shorting clip is mounted in a slot in an inner surface of a wall defining a cavity in the female connector and extends into the cavity to connect with the said at least one terminal or the said two terminals; and wherein the male connector has an end surface which enters the cavity on mating of the connectors and which engages the shorting clip to disconnect the shorting clip from the terminal or terminals on full mating of the connectors.

11. An air bag module as claimed in any one of Claims 1 to 10, further comprising a second electrical shorting clip in said one connector, the second shorting clip being connected with at least one other terminal in

said one connector, the second shorting clip becoming disconnected from the
5 at least one said other terminal on full mating of the connectors.

12. An air bag module as claimed in any one of Claims 1 to 11, further comprising a second connector assembly, the connector assemblies being substantially identical.

13. An air bag module as claimed in any one of Claims 1 to 12, wherein the or each connector assembly is positioned between a pair of fastening means.

14. An air bag module as claimed in any one of Claims 1 to 13, wherein the first connector of the or each connector assembly is secured to the base plate of the air bag module by resilient legs which make a snap fit in openings in the base plate; and wherein the second connector of the or each
5 connector assembly is secured to the base by resilient legs which make a snap fit in apertures in the base.

15. An air bag module as claimed in any one of Claims 1 to 14, wherein a spring is positioned between the base plate and the base to bias the air bag module away from the base.

16. An air bag assembly substantially as herein described with reference to, and as shown in, the accompanying drawings.



Application No: GB 9801696.7
Claims searched: 1 to 15

Examiner: Karl Whitfield
Date of search: 4 August 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B7B (BSBCM, BSBCR)

Int Cl (Ed.6): B60R 21/00, 21/20

Other: Online database: Derwent World Patents Index accessed via Questel

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2288575 A (NIPPONDENSO)	
A	GB 2282574 A (AUTOLIV) figs 3 & 4	

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